

REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of June 18, 2007 is respectfully requested.

By this Amendment, claims 12, 17 and 19 have been amended, and new claims 30 and 31 have been added. Thus, claims 12, 13, 17-20, 30 and 31 are currently pending in the application. No new matter has been added by these amendments.

On pages 2-5 of the Office Action, the Examiner rejected claims 12, 13 and 17-20 under 35 U.S.C. § 103(a) as being unpatentable over Ukrainczyk (US 6,594,419). For the reasons discussed below, it is respectfully submitted that the amended claims are clearly patentable over the prior art of record.

The discussion of the invention provided below makes reference to the specification and figures of the present application. However, these references are made only for the Examiner's benefit, and are not intended to limit the claims.

Amended independent claim 12 recites an optical fiber coupling part which includes an optical fiber, and at least one GRIN lens having an unattached first end and having a second end fusion-spliced with an end of the optical fiber. Claim 12 also recites that the GRIN lens has a numerical aperture NA that is larger than a numerical aperture NA_s of a light emitting source, and that *the light emitting source comprises a semiconductor laser*. Further, claim 12 recites that the numerical aperture NA is 0.43 or more, and that *a tip part of the unattached first end of the GRIN lens is flat*.

Amended independent claim 17 recites an optical fiber coupling part which includes an optical fiber having a numerical aperture NA_f , a first GRIN lens having a numerical aperture NA_1 , and a second GRIN lens having a numerical aperture NA_2 . Claim 17 also recites that the first GRIN lens has an unattached first end, that a first end of the second GRIN lens is fusion spliced with a second end of the first GRIN lens, and that a second end of the second GRIN lens is fusion spliced with an end of the optical fiber. Further, claim 17 recites that *a tip part of the unattached first end of the first GRIN lens is flat*. Claim 17 also recites that the numerical aperture NA_f of the optical fiber, the numerical aperture NA_1 of the first GRIN lens, the numerical aperture NA_2 of the second GRIN lens, and a numerical aperture NA_s of a light

emitting source comprising a semiconductor laser are selected to satisfy the formula expressed by $NA_f \leq NA_2 < NA_s \leq NA_1$.

Ukrainczyk discloses a tapered lens fiber which, as shown in Fig. 4, includes a multimode fiber 4 attached to an optical fiber 6. However, Ukrainczyk does not disclose that *the tip part of the unattached first end of the GRIN lens is flat*, as required by amended independent claims 12 and 17. As shown in Figs. 2 and 3 of the present application, and as explained on page 25 of the replacement English translation, the tip part of the unattached first end of the first GRIN lens is flat, with the second end of the first GRIN lens being fusion-spliced either with an end of the optical fiber (claim 12) or with the first end of the second GRIN lens (claim 17). Ukrainczyk, however, discloses an optical fiber in which “the tip 16 of the tapered multimode fiber 4 has a radius of curvature” (column 4, lines 1-2). Therefore, Ukrainczyk does not disclose that the tip part of the unattached end of the GRIN lens is flat because Ukrainczyk specifically discloses that the tip of the unattached end of the GRIN lens is curved.

It is noted that on pages 5-6 of the Office Action, the Examiner asserts that the left ends of the GRIN lenses shown in Figs. 2A and 2B of Ukrainczyk may be considered flat tips. In this regard, it is noted that the flat ends of the GRIN lenses referred to by the Examiner (*e.g.*, the left-hand side of the GRIN lenses in Figs. 2A and 2B) are not unattached ends of the GRIN lens, as required by amended claims 12 and 17. Rather, Ukrainczyk discloses that the unattached end 34 (Figs. 2A and 2B) and the unattached end 16 (Fig. 4) both have “a radius of curvature” (column 1, line 61, and column 4, lines 1-2). Therefore, Ukrainczyk does not disclose that the tip part of the unattached first end of the GRIN lens is flat because Ukrainczyk specifically discloses that the tip of the unattached end of the GRIN lens is curved.

In addition, as noted by the Examiner on pages 3 and 4 of the Office Action, Ukrainczyk does not disclose a GRIN lens having a numerical aperture larger than a numerical aperture of a light emitting source, as required by independent claims 12 and 17. In addition, Ukrainczyk does not disclose that the numerical aperture of the GRIN lens is 0.43 or more, as required by independent claim 12, or that the numerical aperture of the GRIN lens satisfies the specific relationship required by independent claim 17. Nevertheless, the Examiner asserted that light sources with very small apertures (less than that of a GRIN lens) are known in the art, and

therefore that it would have been obvious for one of ordinary skill in the art to use a small numerical aperture light source with the fiber structure of Ukrainczyk.

In the response filed on March 21, 2007, it was argued that it would not have been obvious to one of ordinary skill in the art to combine a small numerical aperture light source with the fiber structure of Ukrainczyk because such small numerical aperture light sources are not suitable for optical communication. In response to this argument, on page 6 of the Office Action, it is noted that “the Examiner agrees that this is the case for semiconductor lasers.” In this regard, it is noted that amended independent claims 12 and 17 recite that the light emitting source comprises a semiconductor laser. In view of this amendment and the Examiner’s agreement with the argument submitted on March 21, 2007 in this regard, it is respectfully submitted that it would not have been obvious to one of ordinary skill in the art to combine a small numerical aperture semiconductor laser with the fiber structure of Ukrainczyk.

Therefore, for the reasons presented above, it is believed apparent that the present invention as recited in amended independent claims 12 and 17 is not disclosed or suggested by the Ukrainczyk reference. Accordingly, a person having ordinary skill in the art would clearly not have had a reason to modify the Ukrainczyk reference in such a manner as to result in or otherwise render obvious the present invention of amended independent claims 12 and 17.

Therefore, it is respectfully submitted that amended independent claims 12 and 17, as well as claims 13, 18-20, 30 and 31 which depend therefrom, are clearly allowable over the prior art of record.

In addition, the Examiner’s attention is directed to the dependent claims which further define the present invention over the prior art. For example, new dependent claims 30 and 31 recite that the unattached first end of the GRIN lens is arranged so as to directly receive light from the semiconductor laser. It is respectfully submitted that the limitations of new dependent claims 30 and 31 are not disclosed in the applied prior art.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice to that effect is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining

which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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